

Research Paper

# Input Use Pattern of Temperate Fruits Production in Himachal Pradesh: A Comparative Study of Across Farm Size

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## ABSTRACT

Land, labour, Manures & fertilizers are the basic farm inputs in agriculture production. For increasing the crop yield farmers have to make better use of their inputs as they determine the farm cost, therefore, research had been conducted on the different farm sizes to understand the inputs use pattern for different temperate fruit crop production. The study was conducted in the Shimla district of Himachal Pradesh with a sample size of 200 farm households. It was discovered that per hectare application of fertilizers, manures, sprays and insecticides & pesticides in overall crops production is highest among marginal farms and hence is showing decreasing trends with increasing farm size and the possible reason for the same can be an expectation of high returns or landholdings. Above all holding of major farm implements is less among marginal farmers which plays a very key role in improving the performance of inputs and therefore improves farms' resource efficiency which is one of the key concerns in the Indian agriculture sector.

## HIGHLIGHTS

- Manure application reveals a declining trend with the increasing farm size.
- Fertilizer Consumption per hectare is substantially higher on marginal farms.
- The average holding of agriculture implements is increasing with the increase in farm size.

**Keywords:** Input use, Resource use pattern, Resource endowment, Resource efficiency

Factors of production viz, land, labour, capital and management when combined in proper proportion can help to achieve a higher level of efficiency in the farm business. Use of any resource beyond its capacity can result in its rapid depletion and deterioration which may cause severe damage to the sustainability of farming. Similarly, underutilization of resources or misutilization of resources may result in high production costs and thus lower agriculture's efficiency. Therefore, farm production is the result of a transformation of various resources such as human labour, bullock power, mechanical power, water for irrigation, seeds, manures and fertilizers, insecticides and pesticides and cultivation practices etc. As these all-factor inputs are costly

and scarce in nature, the case for their efficient use is self-evident.

A large number of studies was conducted by Tewari *et al.* (1974), Tasnuba Haque (2006), Kumar *et al.* (2011), Kireeti (2013), Singh (2013), Guleria *et al.* (2017), Singh *et al.* (2018) and Singh *et al.* (2020) regarding the role of different factor inputs in Agriculture production and revealed that productivity can be increased by increasing the levels of the variables such as FYM, chemical fertilizers, human labour etc.

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Farm resource endowment and the extent of their use on farms have a direct bearing in determining the overall level of crop production therefore from the present study, one will try to examine the resource use pattern in the production of temperate fruits among the sample respondents and will reveal the magnitude of various farm endowments which will give us an understanding about the nature and extent of inputs utilization by the farmers which however can play a significant role in making practical recommendations for planning a better allocation of existing resources as the study will explain the overuse and under use of different farm inputs for different farm size and different crop.

## MATERIALS AND METHODS

The present study was conducted at Jubbal & Kotkhai block of Shimla district, which was divided into 10 different panchayats and thereafter two villages from every panchayat with 10 farming households of different categories (marginal, small & medium) from each village has been randomly selected & data of 200 farm household has been collected from the study area and analysed with Tabular analysis based on means, percentage and frequency etc.

## RESULTS AND DISCUSSION

### Plantation Pattern

Plantation specifies the number of trees planted under different crop production which further determines the output of different crops therefore Table 1 reveals the plantation pattern in different farm holdings for different crops.

The size-wise analysis reveals that the Apple tree plantation per hectare is higher on small farmers' size however in Almond, Cherry, Apricot and Pears crops per hectare tree plantation on medium

farms is highest. It had also been found that the per hectare tree plantation on marginal farmers for all the crops except Apple is low and a possible reason for the same can be land holding.

Therefore, from the study, it is evident that Pears and Apple plantation occupies the maximum area under cultivation across all the farm size hence specifying the commercial importance of the crops. The study also revealed increasing trends in per-hectare tree plantation on all the crops with increasing farm size.

### Use of Manures

In agriculture, farm manures are considered the backbone of cultivated soils. Farm manures are prepared normally from animal dung. The quality of dung is depending upon its proper management and plays a very significant role in determining the quality of the soil. The data regarding the use of farmyard manure per hectare is given in Table 2.

The manures play a very big role in determining the quality of fruit and plant and are mostly applied to the field in winter. The size-wise analysis reveals that the kg per hectare manures application in Apple, Almond and cherry production is highest in Marginal farmers however in Pears and Apricot production kg per hectare manures application is highest in small farmers, therefore, revealing a decreasing trend with the increasing farm size as the consumption of manures is high in the lower size class, however, it is comparatively low on small and medium farm size in all crops. It had also been found that Apple and pear cultivation occupies 44 per cent of total manure share across all farm size in comparison to other temperate fruit crops.

Therefore, from the study one can see the overall declining trend in manure application as farm size increases and the possible reason for the same is

**Table 1:** Tree Plantation Pattern for the different Farm size (Standard plantation per hectare)

Sl. No.	Particulars	Marginal farmers	Small farmers	Medium farmers
1	Apple trees plantation	202.65 (35.72)	208.21 (26.16)	184.70 (21.32)
2	Almond trees plantation	105.88 (18.66)	159.74 (20.07)	195.29 (22.54)
3	Cherry trees plantation	65.00 (11.46)	98.48 (12.37)	127.30 (14.69)
4	Pears trees plantation	125.56 (22.13)	206.54 (25.95)	215.07 (24.82)
5	Apricot trees plantation	68.24 (12.03)	123.03 (15.46)	144.05 (16.63)
	Total	567.32 (100.00)	796.00 (100.00)	866.42 (100.00)

*Note: Figures in a table are percentage analyses of column total.*

**Table 2:** Manures Application in Apple, Almond, Cherry, Pears and Apricot cultivation (in Kg Per Hectare)

Sl. No.	Crops	Marginal farmers	Small farmers	Medium farmers
1	Apple	7381.17 (38.07)	6476.45 (33.60)	4460.69 (28.37)
2	Almond	3176.47 (16.38)	3157.89 (16.38)	2802.94 (17.82)
3	Cherry	2600.00 (13.41)	2327.27 (12.07)	2367.57 (15.06)
4	Pears	3955.56 (20.40)	4707.69 (24.42)	3656.93 (23.25)
5	Apricot	2376.47 (12.26)	2606.06 (13.52)	2437.84(15.50)
	Total	19389.66 (100.00)	19275.37 (100.00)	15725.97 (100.00)

*Note:* Figures in a table are percentage analyses of column total.

**Table 3:** Fertilizers consumption in Apple, Almond, Cherry, pear and Apricot cultivation (in kg. Per Hectare)

Sl. No.	Crops	Marginal farmers	Small farmers	Medium farmers
1	Apple	807.17 (17.09)	794.75 (18.02)	684.24 (19.85)
2	Almond	1000.00 (21.18)	881.58 (19.99)	650.74 (18.88)
3	Cherry	1000.00 (21.18)	909.09 (20.62)	722.97 (20.97)
4	Pears	944.44 (20.00)	884.62 (20.06)	673.36 (19.53)
5	Apricot	970.59 (20.55)	939.39 (21.30)	716.22 (20.77)
	Total	4722.21 (100.00)	4409.43 (100.00)	3447.53 (100.00)

*Note:* Figures in a table are percentage analyses of column total.

decreasing trend of domestication of livestock with an increase in holding size hence leading to low manures per hectare.

### Use of Fertilizers

The single most important requirement for higher yields in any country is good soil fertility. It is essential in both temperate and tropical climates and irrigated or rain-fed cultivation. That is why chemical fertilizer had been the cornerstone of the green revolution strategy. It was and still is regarded as one of the most crucial requisites for the region since increased fruit production depends heavily on the enhancement of yields and there, in turn, depends on improved soil fertility. The use of plant nutrients along with improved or high-yielding plant varieties is the hallmark of progressive horticulture. It can also be taken as an indicator of the motivation of farmers to maximize income. However, the level and efficiency of fertilizer application are affected by the farmer's perception of risks, expectations of return on cash expenses incurred for its purchase and above all the management practices and information which too must be acquired and refined by experience.

Though the availability of fertilizer is not a serious problem in the study area variation in the application of fertilizer had been observed and this variation is

mainly because of variations in the available farm resources, financial position and managerial ability of the individual farmers as reflected from Table 3. It is apparent from the table that per hectare application of fertilizer is higher for marginal farmers followed by small and medium farmers. It had been recorded 4,722.21, 4,409.43 and 3,447.53 kilograms for marginal, small and medium farms respectively. It can be seen from the table that the consumption of fertilizer per hectare is substantially higher on marginal farms than the other two farm size category and reveals decreasing trends with an increase in farm size.

Thus, it can be concluded that the higher application of fertilizer on marginal farms may be attributed to their financial position, the expectation of high returns per hectare, landholdings etc., apart from their access to the institutions dealing with fertilizer supplies.

### Application of insecticides and pesticides

The use of insecticides and pesticides is required in horticulture as crops are more prone to insect attack which causes harm, not to the fruit but also to the plant. Different types of insects attack the crops in different stages right from the plant's roots to the matured fruit ready to harvest.

The size-wise analysis revealed that the money spent on insecticides and pesticides on marginal, small and medium farm holdings is ₹ 18,857.63, ₹ 13,332.87 and ₹ 9,430.59 which is showing the inverse relationship with the size of the holding. It can be seen from the table that the ₹ per hectare expenses on insecticides and pesticides are substantially higher on marginal farms than the other two farm size category and reveal decreasing trends with an increase in farm size.

Therefore, the study revealed the trends of increasing use of insecticide and pesticides in marginal farms as compare to small and medium farms and reveals decreasing trends with an increase in farm size which could have the rationale of less landholding or excess use of insecticides & Pesticides.

### Use of Spraying (fungicides & insecticides)

As the production of all the crops is commercial therefore the objective of a farmer is to save the crops from all kinds of fungal and insects attack. All these attacks have the potential to destroy the whole crop which can bring huge losses to the farmer, therefore, it is recommended by the department of horticulture that a schedule spray be followed

by every farmer for saving their farms from these attacks.

From the size-wise analysis point of view, marginal, small and medium farmers spend ₹ 64,249.77, ₹ 61,740.96, and ₹ 55,685.47 on sprays per hectare which shows a decreasing trend with the increase in the size of holdings (Table 5).

Therefore, the study revealed that per hectare use of sprays is highest in marginal farms in all crop production and a possible reason for the same is landholding or excessive use of inputs. It was found that the apple crop shows the maximum amount of money spent on sprays per hectare across all the size of holding compares to all other crops.

### The Use of farm implements

Farm implements are very important for farmers as all the input application exercises could not be economically possible without the availability of such implements as it not only increases efficiency but also saves time.

The ownership of implements on farms is presented in Table 6, to begin with, the information regarding major implements can be seen from the table that

**Table 4:** Insecticides & Pesticides Expenses in Apple, Almond, Cherry, Pears and Apricot cultivation (in ₹ Per Hectare)

Sr. No.	Crops	Marginal farmers	Small farmers	Medium farmers
1	Apple	1105.83 (5.86)	1070.39 (8.03)	980.10 (10.39)
2	Almond	4441.18 (23.55)	2968.42 (22.26)	1623.53 (17.22)
3	Cherry	4550.00 (24.13)	3418.18 (25.64)	2841.22 (30.13)
4	Pears	4319.44 (22.91)	2457.69 (18.43)	1144.53 (12.14)
5	Apricot	4441.18 (23.55)	3418.18 (25.64)	2841.22 (30.13)
	Total	18857.63 (100.00)	13332.87 (100.00)	9430.59 (100.00)

*Note:* Figures in a table are percentage analyses of column total.

**Table 5:** Spraying Expense in Apple, Almond, Cherry, Pears and Apricot cultivation (in ₹ Per Hectare)

Sl. No.	Crops	Marginal farmers	Small farmers	Medium farmers
1	Apples	19910.76 (30.99)	20935.46 (33.91)	19901.62 (35.74)
2	Almond	10635.29 (16.55)	10072.37 (16.31)	8752.94 (15.72)
3	Cherry	10768.75 (16.76)	9396.97 (15.22)	7561.49 (13.58)
4	Pears	13005.56 (20.24)	11574.04 (18.75)	11629.56 (20.88)
5	Apricot	9929.41 (15.45)	9762.12 (15.81)	7839.86 (14.08)
	Total	64249.77 (100.00)	61740.96 (100.00)	55685.47 (100.00)

*Note:* Figures in a table are percentage analyses of column total.

**Table 6:** Average agricultural implements holding among the different farm size (per holding)

Sl. No.	Items	Marginal farmers	Small farmers	Medium farmers
<b>1.</b>	<b>Major Implements</b>			
(i)	Grass Cutting Machine	0.03	0.20	0.46
(ii)	Soil Tillers	0.03	0.05	0.20
(iii)	Spraying Machines	0.83	1.17	1.69
(iv)	Grading Machine	0.00	0.07	0.38
(v)	Wood Cutting Machines	0.03	0.13	0.32
<b>2.</b>	<b>Minor Implements</b>			
(i)	Hoes (Phawara)	1.03	1.33	1.83
(ii)	Spades (Belcha Straight from the corner)	1.10	1.55	2.03
(iii)	Sickels (Drati) & Drat	4.93	8.92	13.25
(iv)	Axes (Kuladi)	0.80	1.27	1.76
(v)	Earth digger (Kassi)	4.53	9.50	14.91
(vi)	Shovel (belcha)	0.95	1.30	1.75
(vii)	Iron Rod	0.55	1.05	1.37
(viii)	Pruning & Grafting Knives	0.93	1.62	2.81
(ix)	Ladder	0.28	1.02	1.69
(x)	Kiltas	5.38	9.33	15.00
(xi)	Stepping Machine	1.08	1.63	2.53
(xii)	Carrates	8.78	21.00	46.63
(xiii)	Drums	4.90	8.93	17.16
<b>3.</b>	<b>Total farmers</b>	<b>40</b>	<b>60</b>	<b>100</b>

the average holding of major implements is less on marginal farms as compare to small and medium farms. It had been revealed from the table that there is an increasing tendency of all the minor implements possessed by the farmers with the farm size. When it comes to major implements in different farm sizes, we observed that holding of spraying machines with 0.83, 1.17 and 1.69 is maximum with marginal, small and medium farmers however minor implements are concerned with the holding of carrates with 8.78, 21.00 and 46.63 is maximum with marginal, small and medium farmers. However, in the case of grading machines in major implements, marginal farmers had zero machines as compare to small and medium farmers with 0.07,0.38.

Therefore, from the study, it was revealed that the average holding of agriculture implements is increasing with the increase in farm size and the reason for the same can be land holding however when one look towards the holding of major implements the position of marginal farmers is very weak with zero holdings of grading machines which specifies the role of finances also.

## CONCLUSION & POLICY IMPLICATIONS

From the study, it can be concluded that inputs per hectare applications are more in marginal farms in most of the farm inputs (manures, fertilizers, insecticides & pesticides, sprays) as compared to small and medium farms which therefore increases the per hectare cost. However, on the other hand, the holding of major farm implements is very less with marginal farmers which plays a very important role in influencing resource efficiency hence determining the profits of marginal firms which therefore leads to the following policy implications:

- ♦ As fertilizers, insecticides & pesticides are important farm inputs but an excess of their use decreases production and increases cost therefore marginal farmers are suggested to make rational use of such inputs however for medium farms it is recommended to increase the per hectare manure application as it will improve their soil quality and increase per hectare productivity.

- ◆ It is recommended to marginal farmers improve their major implements holding as it will improve their resource efficiency which therefore can reduce the per hectare cost of production and improves productivity also suggest government provide financial support to the marginal farmers for buying major farm implement as they are very costly and not in the budget of the farmers.

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